NOTES.

THE death of Mr. Joseph Chamberlain on July 2, at seventy-eight years of age, deprives the nation of a statesman who was not only a great political leader in the affairs of his country and Empire, but also gave notable assistance to the advancement of science and education. A few days ago the work done by him and his son, Mr. Austen Chamberlain, was commemorated by the unveiling of portraits of them in bronze relief in the branch hospital at the Royal Victoria and Albert Docks connected with the London School of Tropical Medicine; and the University of Birmingham, of which he was Chancellor, is a sufficient monument to what he did to promote national efficiency through education and research. Mr. Chamberlain began his public work in the city of Birmingham as an educational reformer and took an active part in the work of the first School Board there, while the University was practically founded by him. Speaking at a meeting of the council last week, the Vice-Chancellor, Mr. Gilbert Barling, said that Mr. Chamberlain guided the formation of the University and influenced its constitution in the most liberal and broad-minded manner. He obtained most of the funds for its building and equipment, and took the warmest interest in its welfare during the whole of his life after its foundation. The council of the University has expressed its high appreciation of Mr. Chamberlain's services in this direction by passing the following resolution:—"The council hears with profound sorrow of the death of Mr. Joseph Chamberlain, first Chancellor of the University, to whom the University owed its existence. His liberal and broad-minded views permeated its constitution, his judgment guided its policy from the commencement, and by his personal effort he secured munificent contributions to the funds for the buildings and equipment. The Chancellor's death will be felt by all members of the council and Senate, and indeed by the whole of the University, as a great personal loss." Few statesmen show such zeal for education and science as Mr. Chamberlain did; and we join with representatives of other national interests in mourning the loss of one who understood so well the business of government of a modern State. Mr. Chamberlain was admitted a fellow of the Royal Society in 1882, under the rule which permits the election of persons who "either have rendered conspicuous service to the cause of science, or are such that their election would be of signal benefit to the society."

BY the death of Sir Benjamin Stone, on July 2, at seventy-six years of age, there has passed from us one of the most enthusiastic and energetic of amateur photographers. Although photography was his recreation, he made a business of it in the sense of always working towards a definite end, namely, the getting of pictorial records of the details of the life of to-day. He did not initiate what is now well understood as "record work," but in 1897, when he was sixty years of age, he established the National Photographic Record Association, which did excellent work for twelve years, when it was disbanded so that the work might be carried on more effectively from local centres. During the whole life of the association Sir Benjamin Stone was its head, and we believe contributed personally a greater number than any other member of the nearly five thousand prints which are now deposited in the British Museum. These photographs represent interesting buildings of all kinds, remains of ancient buildings, manuscripts, portraits, ceremonies, customs, such as coronations, the distribution of Maundy money, fairs, and indeed anything that is likely to be of interest, especially when it has ceased to be.

CAPT. J. F. PARRY, R.N., assistant hydrographer, has been appointed to succeed Rear-Admiral Herbert E. P. Cust, C.B., as hydrographer of the Navy from August 16 next.

THE president and council of the Royal Society have awarded the Mackinnon studentship on the biological side to Mr. G. Matthai, of Emmanuel College, Cambridge, for a research on the comparative anatomy of the Madreporaria. The studentship on the physical side has not yet been awarded, and the date for receiving applications has been extended to September 21.

PROF. J. H. APPLETON has retired from the chair of chemistry at Brown University, Rhode Island. He graduated at that University in 1863, and has ever since been a member of its faculty, holding successively the status of assistant instructor, instructor, and professor. Dr. J. E. Bucher, at present assistant professor, is to succeed him in the headship of the department of chemistry.

THE death is reported of Dr. F. W. True, assistant secretary of the Smithsonian Institution, Washington. Born in 1858, Dr. True graduated at New York University in 1878, and in the same year entered the service of the U.S. Government, of the exhibits of which he was custodian at the Berlin Fisheries Exhibition of 1880. From 1883 to 1911 he held curatorships at the National Museum, of which he had previously been librarian. His publications included "A Review of the Family Delphinidæ," "The Whalebone Whale of the Western North Atlantic," and "An Account of the Beaked Whales of the Family Xiphiidæ."

THE Board of Agriculture and Fisheries is informed that on May 26 a porpoise was caught in a kettle net at Dungeness and transferred to Brighton Aquarium, where she arrived in good condition. She was noticed to be in an advanced stage of pregnancy when placed in a tank, and on the afternoon of May 31 gave birth to a young male, which was stillborn. The young was perfectly formed, and measured 2 ft. 2 in. in length, and weighed approximately 7 lb. Unfortunately the mother died on June 10.

IN the course of excavations to reach the base of the Red Crag at Thorington Hall, Wherstead, near Ipswich, Mr. Reid Moir has found the skeleton of a young female, about seventeen years of age, at a depth of 6 ft. from the surface of the ground. The Crag at this spot is capped by a hard, compact, loamy material, in all probability decalcified Boulder Clay, and the bones had been buried in a grave which was plainly visible in the loam. The body, of which nearly every bone has been recovered, had evidently been buried upon the back, and in the contracted position, the head being turned over the left shoulder and facing due west. On the right-hand side of the skeleton the fragments of an urn were found, which has now been rebuilt, and found to be an elaborately ornamented drinking vessel of the late Neolithic or early Bronze periods. No implements or ornaments of any sort were found with the remains. Both the human bones and the pottery are at present in the care of Prof. Keith at the Royal College of Surgeons, Lincoln's Inn Fields, W.C.

THE Royal Academy of Belgium has issued its programme of prizes to be awarded during 1915. Among the subjects in mathematical and physical science for theses on which prizes from 35*l.* to 40*l.* are offered may be mentioned: the absorption of light in interstellar space; the viscosity of liquids and gases and the properties of fluids near the critical temperature; the organo-metallic compounds of one or more metals of the chromium group; infinitesimal geometry of curved surfaces; and conic systems in space. In the natural sciences, prizes of the same value are offered for researches in the following subjects: the significance of various inflections of the electrocardiogram; the spermatogenesis of burrowing hymenoptera; the subalpine flora of Belgium; a petrographical and geological description of some metamorphic region of the Ardennes; and descriptions of certain groups of Belgian minerals. The memoirs should be written in French, Flemish, or Latin, and be sent, post paid, to M. le Secrétaire Perpétuel, au Palais des Académies, à Bruxelles, before August 1, 1915. The bulletin from which the above particulars are taken also gives information concerning the various permanent prizes to be awarded during the years up to 1918.

THE list of Civil List pensions granted during the year ended March 31 last includes the following grants for scientific services:—Mr. A. J. M. Bell, in recognition of his valuable contribution to geology and palæontology, 60*l.*; Mrs. Traquair, in consideration of the services to science of her husband, the late Dr. R. H. Traquair, F.R.S., and of her own artistic work, 50*l.*; Mrs. Gray, in recognition of the valuable contributions to the science of anthropology made by her husband, the late Mr. John Gray, 50*l.*; Mrs. Wallace, in consideration of the eminent services to science of her husband, the late Dr. Alfred Russel Wallace, O.M., F.R.S., 120*l.*; Mrs. Alcock, in recognition of the valuable contributions to the study of physiology made by her husband, the late Prof. N. H. Alcock, 50*l.*; Mrs. Ward, in recognition of the eminent services of her husband, the late Prof. Marshall Ward, F.R.S., to botanical science 40*l.*; Dr. Oliver Heaviside, F.R.S., in recognition of the importance of his researches in the theory of high-speed telegraphy and long-distance telephony, in addition to his existing pension, 100*l.*; Miss Hearder, in consideration of the contributions to electrical science and telegraphy of her late father, Dr. J. N. Hearder, 70*l.*; Miss Willoughby, in consideration of the services of her late father, Dr. E. F. Willoughby, in connection with questions of public health, 30*l.*

IT is curious that whereas transatlantic telegraphy by submarine cables was accomplished many years before transatlantic wireless telegraphy, the reverse order of things appears more likely in the case of telephony. The great difficulty in long-distance cable telephony is the attenuation and distortion of the current waves in the cable by the effect of its capacity, and in an Atlantic cable it would—at any rate, with our present knowledge—be too expensive to compensate for by "loading" with artificial inductance. In wireless telephony, on the other hand, there is no such distortion depending on the distance. The difficulties are mainly concerned with finding a source of waves with a sufficiently high group frequency in the case of discontinuous waves, or of sufficient steadiness in the case of continuous waves, and constructing a microphone able to deal with the heavy currents necessary at the transmitting end. Successful experiments overcoming these difficulties to a greater or less extent, and in various ways, have been made by several investigators over moderate distances, and it would appear that it is now only a question of time to produce perfected apparatus of greater power, so that a longer range may be covered. Now that the large wireless station near Carnarvon is complete, Mr. Marconi hopes to succeed in telephoning to New York, and, according to a statement made by Mr. Godfrey Isaacs, chairman of the Marconi Company, before the Dominions Royal Commission last week, hopes to do so by the end of this year.

"THE Plumage Bill: What it Means," is the title of a timely brochure by Mr. James Buckland—who may well be called the birds great protector—written with the object of influencing public opinion and stimulating the supporters of the Bill to further exertions in restoring those of its clauses which have been rendered almost nugatory by changes in Committee. In it we find a restatement of the evidence of creditable authorities and eye-witnesses—among them of A. H. Meyer, "himself a one-time plume hunter" and "thoroughly conversant with the methods employed in gathering" them—of the "horrors of the plume-trade," in Florida, Oregon, Australia, Lysan Island, New Guinea, India, and elsewhere, in which egret, grebe, pelican, albatross, kingfisher, and bird of paradise are immolated in millions to gratify the vanity of those women who *will* be feather-decorated whatever be the cruel methods by which their ornaments are obtained. Mr. Buckland emphasises the economic aspect of the question, and the enormous value of birds to the agriculturist in America, Jamaica, Russia, South Africa, and Australia, in which insect pests and rodents—all forming food of birds—are destructive almost beyond computation. Mr. Souef has ascertained by investigation that in a field attacked by a horde of grasshoppers in Australia, a flock of ibises, spoonbills, and cranes which hurried to the spot, were responsible for the destruction daily of 482,000,000 of the marauders. The devastation wrought by them would be infinitely greater if these birds should become exterminated. We commend this pamphlet to all interested in the wanton destruction of birds; and we trust that when the Bill comes up again before the House the "amendments" will be rejected and that the Bill in its original form may reach the statute-book before the close of this session.

IN *Man* for June Prof. J. Macmillan Brown announces the discovery of a new form of Pacific Ocean script in the little island of Oleai or Uleiai, one of the most westerly of the Caroline group. The chief, Egilimar, furnished a list of fifty-one characters, each of which represents a syllable. It has no connection with any other well-known alphabets, the only other script known in the groups or islands of the Pacific being that of the Easter Island tablets, which are ideographic. The Oleai syllabic script is a stage further than these in the development of an alphabet. The script is at present known only to five men on the islet: but it is probably a relic of a wide usage in the archipelago. A similar commercial script is that used in the island of Yap. This Oleai script is manifestly the product of long ages for the use of a highly organised community; in other words, it must have belonged to the ruling class of an empire of some extent that needed constant record of the facts of intercourse and organisation.

THE Commonwealth of Australia, in connection with the approaching visit of the British Association, has issued a "Federal Handbook," describing the continent in its scientific and historical aspects. This book contains in a compressed, but readable, form more information than is elsewhere accessible. Among the more important articles may be noted that on history by Prof. Ernest Scott, on physical and general geography by Mr. Griffith Taylor, and a very useful account of the culture and beliefs of the aborigines by Prof. Baldwin Spencer. The book is at present issued only in a limited edition, and it may be hoped that it will be re-issued to meet the wants of a wider public. The value of a new edition would be increased by a more adequate supply of maps, that of Australasia in particular being on such a small scale, with the names printed in such small type, as to be of little use for practical purposes.

A COLLECTION of fishes from the Rupununi River, British Guiana, is catalogued by Mr. H. W. Fowler in the April issue of the Proceedings of the Philadelphia Academy. A number of species are described as new, a few of which are referred to new genera or subgenera.

THE second part of the first volume of the new series of the Transactions of the Vale of Derwent Naturalists' Field Club contains one article by the president, Mr. R. S. Bagnall, on the woodlice of Northumberland and Durham, and a second on the centipedes and other myriapods of the Derwent Valley.

SPECIES-BUILDING by hybridisation and mutation is the title of an article contributed by Prof. J. H. Gerould to the June number of the *American Naturalist*. No evidence, it is urged, that species breed absolutely true on a large scale is at present forthcoming, and the assertion that hybrids between well-defined species are invariably infertile *inter se* is far from representing the true facts of the case.

MIMICRY and protective resemblance was the subject chosen by Mr. Rothschild for his presidential address at the anniversary meeting of the Hertfordshire Natural History Society, held at Watford on February 26. As reported in vol. xv., part 3, of the society's Transactions, the president considers natural selection to be the only adequate explanation of the phenomenon. "If a variable species happens to occur together with one or more species which are protected in some way, those individuals of the variable species more or less resembling the protected species have a greater chance of surviving and propagating than the individuals which are not similar to some protected form of animal. The result will be that in the course of generations the offspring will become more and more similar to the models and the dissimilar examples will gradually be weeded out."

STUDENTS of invertebrate histology will find much to interest them in Miss Sophie Krasińska's memoir, "Beiträge zur Histologie der Medusen," in a recent number of the *Zeitschrift für wissenschaftliche Zoologie* (Bd. 109, Heft 2). Zoologists are accustomed to look upon the histological structure of the jelly-fish as of a very simple character, and, although the discovery is not a new one, it is surprising to find them provided with striated muscle fibres which seem to resemble so closely those of arthropods and vertebrates. The memoir is beautifully illustrated, and shows how much we may still hope to add to our knowledge of the microscopic structure of invertebrate animals by the application of modern methods of investigation.

A NEW series of blue books dealing with Fishery Investigations is now being issued by the Board of Agriculture and Fisheries. Series I. relates to salmon and freshwater fisheries, and vol. i. is now before us. It contains two reports by Dr. A. T. Masterman, of which the first is on investigations upon the salmon with special reference to age determination by the study of scales. The material examined consisted of records of salmon captured in the Wye in the nettings made by the Wye Fisheries Association, including special experimental nettings made during the close season. The most important data deal with the year 1911, commencing in the month of April. The scales of a large number of fish were secured and were specially studied from the point of view of age determination. Dr. Masterman concludes that the majority of Wye smolts remain for two years in the river, but a small proportion remain three years. The scale may be used as a fairly accurate gauge of the age of individual fish up to and including the grilse stage, but is not available for estimation of the period of time spent in the river after the return of the fish. The author regards age estimates of spawned fish from the scales as being of very doubtful value. Dr. Masterman's second report deals with observations on the smelt (*Osmerus esperlanus*). The scales of the smelt are specially suitable for age determination on account of the clear and definite arrangement of the ridges upon them, and the study of these scales is of considerable value in connection with the general question of the trustworthiness of the method of age-determination by means of scales.

VOL. cxxiii. of the *Sitzungsberichte* of the Vienna Academy of Sciences contains a paper presented on March 26 by Dr. J. v. Hann on the daily range of meteorological elements at the Panama Canal, based on hourly or two-hourly observations made at several stations. The harmonic analysis of the data (pressure, temperature, and humidity) is preceded by tables of monthly and yearly means. The latter show that the highest mean temperature and lowest relative humidity occur in March and April, and the lowest temperature in November. From May to October the humidity is uniformly high, and especially so from January to April, while Colon (on the Atlantic coast) is much damper. Rainfall increases from the Pacific to the Atlantic shore, January to March being very dry. The wettest months on the Pacific slope are May, October, and November; on the Atlantic coast July and October are wettest. Without entering into detail here respecting the results of the laborious calculations entailed in computing the harmonic constituents, we may note that both the whole-day and half-day periods show that an increase of 10° C. in temperature corresponds to a decrease of about 36 per cent. in the relative humidity. Dr. v. Hann remarks that this relation between the two elements is exceedingly regular.

MESSRS. ISENTHAL AND CO. have produced an improved type of electrolytic rectifier. The older forms of the aluminium rectifier or "valve" for converting alternating into continuous current were never very popular; trouble was experienced due to heating of the electrolyte, and the arrangement of the four cells, usually of glass, necessary for rectifying both half-waves of the alternating current, was not always a convenient one. In the new design the electrodes, which are in the form of grids protected from action of the electrolyte at the surface level of the liquid, are placed in a solid seamless steel tank, instead of in four separate glass vessels. The trouble due to temperature rise appears to have been overcome, and the whole apparatus is in a compact and workmanlike form.

THE Board of Trade has now issued a report on the new sight tests used in the Mercantile Marine. This report covers the period of April 1 to December 31, 1913. An improved wool test in which the candidate has to match five colours, and a lantern test, were used. The cases of colour-blindness are divided into those definitely rejected by the local examiners and those referred for a special examination, the local examiner being doubtful. Of the 286 definitely rejected in the local examination 148 failed in both the lantern and the wool test, and 138 failed in the lantern test only; there was no failure with the wool test which passed the lantern test. Of the 286, 93 appealed, 26 being successful. Of 125 referred cases, 20 were referred on both the lantern and wools, 101 on the lantern only, three on the wools only, and one on form vision as well. Of this number there were thirty failures; three of these were referred on both the lantern and wool test, twenty-six on the lantern only, and one on form vision as well. Those referred on the wool test alone were passed.

IN the April number of *Le Radium*, which has just reached us, Dr. C. Ramsauer, of the Radiographic Institute of the University of Heidelberg, describes a simple method of determining the amounts of radium, thorium, and actinium present in materials, even when the amounts are very small. The method consists in heating the materials to 1150° C. for four minutes, so as to drive out the radio-active emanations accumulated in the material, condensing it on a cold surface, and then studying the decay of activity of the material condensed. By a comparison of the decay curve with the decay curves obtained in the same way from the three radio-active substances separately, he finds he can deduce the quantities of the three present in the material tested with an accuracy of about 20 per cent. A test of the Kreuznach waters by this method led to a result in agreement with that previously obtained by the more accurate method of Becker which, however, determines the radium content only.

THE June number of the Proceedings of the Physical Society of London contains several papers of exceptional interest. In the first instance, there is the Guthrie lecture by Prof. R. W. Wood, on his recent work on resonance spectra, which he hopes will do something towards unlocking the secret of molecular radiation. This lecture, which is the first given, is very suitably introduced by a historical note from Prof. G. C. Foster relating to Prof. Guthrie, to whom the Physical Society owes its foundation. A second paper, by Dr. J. G. Gray, describes a number of new gyrostatic devices for manœuvring and stabilising a variety of moving bodies from torpedoes to airships. This paper is well illustrated. Mr. W. R. Bower shows that the problem of the rainbow may be treated by geometrical methods with great advantage, and Mr. S. Butterworth describes a zero method of testing vibration galvanometers. In two papers on radio-active problems, Messrs. T. Barratt and A. B. Wood furnish grounds for the belief that thorium-C consists of two substances, one giving the α and the other the β radiation, and Messrs. H. P. Walmsley and W. Makower show that the path of an α particle projected along a photographic plate is visible on development, and may be used to study the scattering of the particles by matter.

A PAPER dealing with the design of floats for hydro-aeroplanes has been issued from the recently reopened Langley Aerodynamical Laboratory, and relates to experiments carried out on models in the naval tank at Washington. The results confirm those obtained elsewhere, and show that the float requiring least power for leaving the water is one with a V-shaped bow. Such a bow sends up a remarkable sheet of water which must be turned down again by the shoulder of the float if the best results are to be obtained. All the experiments were carried out with floats having a single step, and it is stated that the step should be well ventilated; air was allowed access to the step through one or two passages from the upper surface of the float, but without the assistance of cowls to increase the air pressure, an assistance which has been found advantageous in the case of experiments made elsewhere. Reference is also made in the paper to the pitching moments which arise when a float having a single step is used, and it is pointed out that whilst getting up speed the air controls are ineffective at first, and to reduce the period of lack of effective control it is proposed to put the step near to the centre of gravity. Certain disadvantages of another kind are thereby introduced, and for various reasons the above position has not yet been accepted as the best by all designers of hydro-aeroplanes.

We have received from Washington a "Classified List of Smithsonian Publications Available for Distribution, April 25, 1914," published by the Smithsonian Institution. The papers included in the list are distributed gratis, except as otherwise indicated. Applicants for the publications are asked to state the grounds for their requests, as the institution is able to supply papers only as an aid to the researches or studies in which applicants are especially interested.

The Congress of Naval Architects at Newcastle during the present week is marked in *Engineering* for July 3 by a number of articles descriptive of Tyneside engineering and shipbuilding works. Among these is a description of the appliances used in testing turbo-dynamos at the Heaton works of Messrs. Parsons, the success of the Parsons turbine-driven electric machinery being largely a consequence of the experimental work carried out by aid of this installation, which now admits of extensive and accurate testing work being done. Provision is made for testing at full load for several hours continuously turbo-dynamos having an output of more than 3000 kw. There are three large water-tube boilers and one Lancashire boiler and a network of pipes arranged so that steam may be supplied to any of the numerous test-beds. A separately fired superheater is used, so that almost any desired degree of superheat can be obtained. There are two independent condensing plants. Two powerful Heenan and Froude water-brakes have been installed, with which geared turbines may be tested up to 3000 brake-horse-power.

The eleventh volume of the Journal of the Institute of Metals has now been issued. The volume runs to 437 pages, and is divided into three sections. The first contains minutes of proceedings, and is concerned largely with the annual meeting held in London last March. The presidential address by Sir Henry J. Oram, K.C.B., is printed in full, and the papers read at the annual meeting are also included, together with reports from the institute's committees. The second section is made up of a valuable collection of abstracts of papers relating to the non-ferrous metals and the industries connected therewith. The third part contains the memorandum and articles of association and a list of members. The volume has been well edited by the secretary of the institute, Mr. G. S. Scott, and is published by the institute, Caxton House, Westminster, at the price of 21*s*. net.

OUR ASTRONOMICAL COLUMN.

A Faint New Comet (1914*c*).—A Kiel telegram, dated July 1, announces the discovery by Neujmin of a new comet on June 29 at 13h. 35·3 Simeïs mean time. It is stated to be of magnitude 12, and its position is given as R.A. 18h. 5m. 24s., and declination 12° 55′ S.

A further telegram from Kiel, dated July 2, gives Dr. Graff's observation of this comet on July 1 at 11h. 56·4m. Bergedorf mean time. Its magnitude is given at 12·5, and its position, R.A. 18h. 3m. 17·5s., and declination 12° 26′ 44″ S. A supplement to the *Astronomische Nachrichten* (No. 4747) gives some further positions. Aitken and Tucker observed the object with the 36-in. refractor on July 1 at 12h. 13·1m. Mount Hamilton mean time, and gave the position R.A. 18h. 2m. 52·5s., and declination 12° 21′ 29″ S. Graff and Schorr on July 2, at 11h. 36·5 Bergedorf mean time, state the object to be of magnitude 12·5, and situated at R.A. 18h. 2m. 13·2s., and declination 12° 12′ 53″. The comet is at present situated in the constellation of Serpens, and is a little south of Eta.

Opposition of Eros (433) this Year.—While the opposition of Eros, which will occur on September 18 of the present year, is not a very favourable one as regards its distance from the earth, Prof. E. C. Pickering directs attention to the occasion for pursuing a photometric study (Harvard College Circular, No. 183). By the courtesy of Prof. Cohn, director of the Recheninstitut, Prof. Pickering publishes the ephemeris and other data concerning this object from June 30 to the end of the year, to assist those making observations. The author publishes the interesting statement regarding a reduction now in hand of a large series of observations made by the late Oliver C. Wendell, which has indicated a new fact in the photometry of asteroids. It appears that Eros in 1898 was more than a magnitude fainter than in 1900. Similar changes occurred in other asteroids, as was shown in the case of Juno (3) (Har. Ann., xlvi., 201). When all the corrections are applied for distances from the sun and earth, for phase, and for variation due to rotation, another large source of variation is still apparent the cause of which is difficult to explain. Prof. Pickering emphasises this as an additional reason why observations both of the relative and absolute magnitude of Eros should be made this year.

Recent Publications of the Allegheny Observatory.—Dr. Frank Schlesinger and Mr. Charles J. Hudson give the results of a preliminary investigation (vol. iii., No. 9) regarding the determination of star positions by means of a wide-angle camera. The object of the research was to find a method of charting stars which would overcome the difficulty of insufficient comparison stars; the employment of a wide-angle camera will permit of a larger area of the sky being photographed on one plate. So far as the investigation has gone, the doublet used is considered well adapted for cataloguing purposes, and it covers a field of 25 square degrees, as compared, for example, with the 4 square degrees in the case of the plates for the Astrographic Catalogue. In another number (vol. iii., No. 11) Dr. Schlesinger gives a description with two plates of a large screw-measuring engine designed for taking plates of all sizes up to 8 × 10 in., and adapted to the measurement of stellar and solar spectrograms, as well as ordinary celestial photographs. The engine seems to have given great satisfaction, both for its convenience and accuracy of performance. Nos. 10 and 12 of the same publication give the orbits of the variable stars 18 Aquilæ and